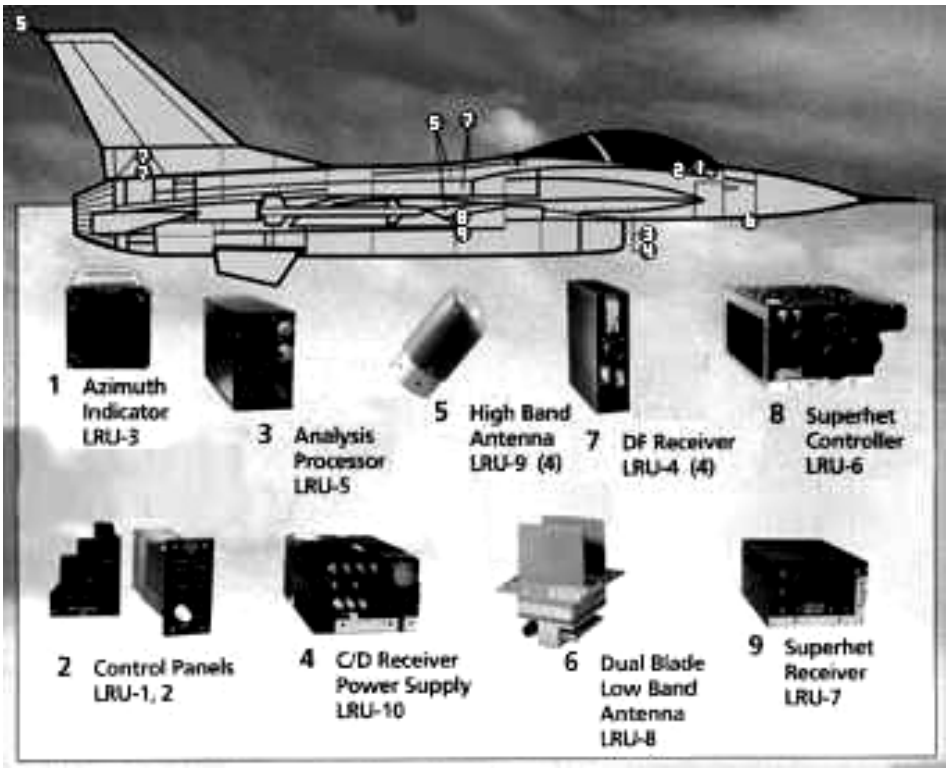
RADAR WARNING RECEIVER (RWR) AN/ALR-56M



Air Force ACAT III Program

Total Number of Systems:	533
Full-rate production:	2QFY93

Prime Contractor

Lockheed Martin Fairchild Systems

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The AN/ALR-56M Radar Warning Receiver (RWR) contributes to the ***Joint Vision 2020*** concept of ***full-dimensional protection*** by improving individual aircraft probability of survival through improved aircrew situational awareness of the radar guided threat environment. ALR-56M includes a fast scanning superhet receiver, superhet controller, analysis processor, low band receiver/power supply, and four quadrant receivers. It provides inputs to the ALE-47 CMDS (Countermeasure Dispenser System) to enable the selection and dispensing of chaff and/or flares for aircraft self-protection. The ALR-56M is designed to provide improved performance in a dense signal environment and improve detection of modern threat signals compared to the version of the ALR-69 that it replaced. A miniaturized version of the F-15's ALR-56C, the ALR-56M is a form and fit replacement for the ALR-69 RWR in the F-16 Block 40 and other aircraft. ALR-69 upgrades are underway for earlier blocks of F-16 and other aircraft. The ALR-56M is the RWR chosen for integration into the open architecture Defensive System Upgrade Program in the B-1B bomber Conventional Mission Upgrade Program. The ALR-56M upgrades are developed in conjunction with upgrades to the ALE-47.

BACKGROUND INFORMATION

A December 1992 DOT&E BLRIP report stated that AN/ALR-56M was effective and suitable. In addition, the 1992 DOT&E BLRIP report recommended FOT&E "because of the deferral of tactics verification testing and the concern about bearing errors and delayed deletions during extensive maneuvers." The current TEMP calls for additional ALR-56M testing as part of continuing Block 40 and Block 50 F-16 follow-on testing.

The National Defense Authorization Act for the Fiscal Year 1989 Conference Report directed that "all future operational results for RWR update programs be reviewed and approved by the Director of Operational Test And Evaluation, prior to obligation of production funds." AN/ALR-56M is such a program.

FOT&E has been conducted by the U.S. Air Force Air Combat Command (ACC), Air Warfare Center on subsequent software versions. ACC has continued routine upgrades to Mission Data Table software to keep pace with the changing electronic order of battle priorities for various geographical areas of operation. However, tactics verification testing during FOT&E resulted in notations in the ALR-56M User's Handbook concerning the operational significance of the performance problems considered to be training issues. Training is required to ensure that aircrews understand ALR-56M performance during maneuvering.

Operationally Significant Changes to the ALR-56M. Some of the major operationally significant changes associated with the latest software upgrade, Operational Flight Program (OFP) 0040, include the following:

- **SADS (Simulated Air Defense System) X Processing.** This change reduces ambiguities between the SADS X TTR (target tracking radar) and AI (airborne interceptor) radars.
- **Burst Enhancements.** This change reduces the number of multiple threat symbols associated with burst-ranging radars.
- **Missile Launch Audio Recycle.** Missile launch audio warning will now repeat instead of being a one-time initial warning.
- **Excess Maneuvering Fast Ageout and Redisplay.** During excess maneuvers, threat symbols will age out as soon as a break-lock occurs, and will re-display as soon as a new lock-on occurs.

The ALE-47 CMDS (Countermeasure Dispenser System) operational flight program (OFP) 9023 is concurrently being upgraded along with the ALR-56M OFP 0040 block changes. The ALE-47 CMDS is a software-controlled system designed to counter target tracking radars, radio frequency, and infrared missile seekers using chaff and flares. ALE-47 can dispense countermeasures using any of six pre-programmed manual programs. It can also use threat information from ALR-56M and aircraft altitude information from aircraft avionics to calculate optimal dispense programs for a given threat type, range, and azimuth. In AUTO mode, ALE-47 will automatically dispense calculated programs without pilot command. In semiautomatic, ALE-47 will dispense a calculated program only when the pilot commands activation.

Operationally Significant Changes to the ALE-47

- **Track File Ambiguity Message.** When the RWR determines a threat signal is ambiguous with one or more other threat signals, the OFP 9023 provides the capability for ALE-47 to consider the three highest priority ambiguities when calculating a dispense program.
- **Squib Failure Tracking.** Expendables that either fail to poll or misfire will be identified and discarded.
- **System Checkout.** This update provides the capability to complete a ground check of the ALE-47 system without having to load special mission data.

TEST & EVALUATION ACTIVITY

Desired changes to the fielded OFP are a culmination of user requirements consolidated and prioritized by Headquarters, Air Combat Command, Air Force. Some of these requirements include deficiencies noted in previous testing, desired enhancements targeted at handling evolving threats, as well as man-machine interface improvements directed at improving pilot situational awareness. A broad summary of those software changes include: (1) update of Mission Data threat parameters; (2) improved threat information interface with the ALE-47 expendable countermeasure dispensing system (OFP 9023); and (3) improved detection of emitters with complex waveforms.

Developmental Flight Testing of ALR-56M 0040 OFP, the latest software version upgrade, occurred at the 416th Flight Test Squadron at Edwards AFB, CA, where over 20 developmental flight tests were conducted encompassing a variety of Air-to-Air and Air-to-Ground mission profiles. The system transitioned to the 36th Electronic Warfare Squadron at Eglin AFB, FL, where it entered Phase I Operational Testing (Familiarization & Training). Several significant deficiencies were discovered in both DT and OT, and the program was halted for corrections. The current schedule requires delivery of new, corrected software for DT in 4QFY00, followed by a combined DT/OT at Eglin during 1QFY01. A dedicated FOT&E is slipped until mid-FY01 at the earliest.

TEST & EVALUATION ASSESSMENT

Technical challenges to fielding the new software update center on resolution of problems with the new mission data generator, which requires an extensive update for the new software version. Challenges do not appear insurmountable, but will require continued use of early system integration and robust testing to resolve and produce an effective and suitable upgrade.